

Integrating textile sustainability into undergraduate design curriculum in Pakistan

Sania Mubarak¹ and Nimra Sajjad²

Abstract

With increased worldwide awareness of environmental challenges. Designers ought to comprehend the significance of sustainable textiles in the industrial and educational sectors. Western societies are already embracing sustainable techniques in both areas. As an educator and textile designer inspired by UNESCO's sustainable development goals, the researcher intends to educate the educators, designers, and policymakers who resonate with this article. On the other hand, Pakistan's textile industries export a range of merchandise products utilizing sustainable processes. However, Pakistan's higher education system, which produces designers, is at a critical crossroads that requires concerted efforts to incorporate sustainability into their lives. This research article emphasizes the need to practice sustainability in textiles in juxtaposition with western practices. Moreover, proposed considerable methodological approaches that can be implemented in order to educate the designers studying textile and fashion-related fields in higher education institutions in Pakistan.

Keywords: Pakistan higher education, sustainable processes, textile design education, sustainable design practices, UNESCO, sustainable development goals, sustainable solutions, industrial sustainability

Introduction

Due to rapid climate changes over the decades, the surface of the earth and the living creatures require conscious and consistent efforts to prevent it from falling into more catastrophic global climate conditions. To build a prosperous future for the subsequent generation, an individual must be crucially moving forward right now. Since the adolescents of today will determine our future, it is

¹⁻² Department of Textile Design, School of Art, Institute for Art and Culture, Lahore – Pakistan

imperative that we educate them today to guarantee the best favorable outcome. To interpret the definition of sustainable development, the International Institute for Sustainable Development (2022) defines it as accommodating the present needs and demands without sacrificing the needs of the posterity of the future generation. This may also refer to “design for the environment,” which is actively taking the initiative to develop a design process that is sustainable and adaptive in nature. Textile manufacturing products are a collaborative procedure of STEM and STEAM where the art of producing sustainable materials with diverse processes innovates for an eco-friendly environment.

A modern-day enrollee at Pakistan's public or private design schools has to be acquainted with the challenges that the textile industry experiences. Additionally, they must learn about the sustainable techniques that the industry employs. This is how they could potentially be trained to find employment in domains that go beyond the general practices of textile design, which frequently include surface designers, weave pattern designers, merchandisers, or professional print designers for home textiles or clothing. Despite this, for more than a decade, the textile design graduate has been engaged as a textile artist, textile sculpturist, or styling and producing garments in conjunction with fashion-related companies. It is imperative that designers are intentionally exposed to the demands, difficulties, and procedures of textile sustainability throughout their academic journey, for the purpose of expanding their career opportunities.

Being an educationist for more than a decade in the textile design education system. At this point, it is imperative to produce sustainable designers who can contribute to Pakistan's textile industry for a sustainable future. However, textile engineers are the major contributors to sustainable practices on the commercial side, though collaboration with designers could benefit both industries and institutions on a national and international level. As a critical thinker and researcher's self-curiosity over the past six years led to the investigation and experimentation of the textile sustainable processes and methods on a limited subjective level, which were merely student-supervised projects at an educational level. However, design institutions across the globe empower their students to have professional competencies regarding sustainable approaches and practices during their academic experiences. These capabilities produce more innovative, research-based, sustainable projects. Such initiatives and projects are emphasized in the studies conducted by Graedel et al. (1995), Leerberg et al. (2010), and Wood et al. (2022).

Most prominently, Wahr et al. (2013) implicate incorporating education for sustainable development in Bachelor degrees of textile design in Australia. The curricula proposed by them adequately equip, motivate, teach skills, and gain knowledge by the students. Similarly, this research promotes the importance of sustainability required in the textile design curriculum that could transform the learning boundaries of the students. However, the interpretation of textile sustainability is open to individuals, as the perception may vary from one individual to another. Overall, the broader objective of the research is to serve and protect nature from more hazardous practices. In addition, the research shows the potential to fill the gaps of practicing sustainable textile design projects that need to be explored in the future.

Review of the Literature

Scholarly writings, books, articles, manuals, reflective practices, official industrial websites, and reports provide the reasoning for the publication. The sources on textile sustainability, local and international industrial practices, diverse perspectives of comprehending the approach and teaching and learning by national and international scholars' studies like Graedel et al. (1995), Leerberg et al. (2010), Ellen MacArthur Foundation (2013), Cao et al. (2013), Wahr et al. (2013), Ashwin (2014), UNESCO's Education for Sustainable Development Goals; Learning objectives (2017), Faize et al. (2018), and Wood et al. (2022). These provide an investigation of the existing knowledge of the present study and also provide a point of reference to the previous ones. It may also bridge the gap for future research-based projects yet to be explored. The socio-cultural orientation of Asian regions varies from that of Western countries, including Australia, Denmark, the United Kingdom, and parts of Europe, where much of the literature currently in publication is Western-centric. Scaffolding: It contains books, papers, journals, articles, and studies that provide insight into the kind of assistance that's required to ensure that instructions are carried out as effectively as feasible.

Shortfalls and demand for research-based projects

The occidental studies of Leerberg et al. (2010), Wahr et al. (2013), and Wood et al. (2022) urged educators, designers, and curriculum designers to take initiatives for United Nations sustainable development goals and Textile 2030. It is emphasized by Wahr et al. (2013), and Wood et al. (2022) that the revolutionary shift in the textile

and fashion industry would be brought by the professionals of the future. Furthermore, the higher education curricula suggested by Wahr et al. (2013) that desire to incorporate sustainable development in education should be prepared for curriculum change and adequately equip, motivate, and train academicians to teach it. The examinations of perspectives and sustainable practices embedded in their undergraduate degree of arts, specifically in textile design, transform the learning environment. The collaborative action applied theories into practice and self-reflection to critique. Hence, the research redefined and restructured the sustainability knowledge and practices in their degree program with appropriate pedagogy required for curriculum change.

Similarly, a study by Wood et al. (2022) innovates an alternate lab-grown textile material using bacterial cellulose for the fashion design curriculum. The pilot projects of secondary school students implemented a pedagogical model based on Kolb's experiential learning theory. This environmentally sustainable approach challenged the concept of textile inventions for apparel. Likewise, the transformative power proposed by Ashwin (2014) to change students' comprehension of teaching and learning in higher education could be put forward as "knowledge-as-research, knowledge-as-curriculum, and knowledge-as-student-understanding." Furthermore, a case employed by Leerberg et al. (2010) emphasized both practice-based and theory-based approaches to innovate sustainable solutions. An educational challenge is to argue on the value of teaching responsible design alternatives using different learning and teaching methods to produce sustainable designers.

Consequently, the pedagogical strategies for teaching and learning used in Pakistan at the undergraduate level need to be reconstructed, reenvisioned, and reconsidered. According to the studies by Faize et al. (2018) and Ashwin (2014), that the quality of teaching and learning is more teaching-oriented rather than emphasizing the quality of learning. The research from Pakistan by Faize et al. (2018) continued to unfold the essential factors for the shortcomings. In particular, showing disinterest in research work by both faculty and students, shortage of appropriate resources in terms of human and material support from the work organizations, and unavailability and incapacity of research assistants. The most stressed feature was no or poor system of incentives and rewards, along with inadequate research skills.

Perspectives to promote a “Green” environment

The learning objectives of “Responsible Production and Consumption” (2017, pp. 34-35), the twelfth sustainable development goal, ensure the patterns to sustain the livelihood of current and future generations. To understand the needs and wants of the natural environment, one has to be empathetic and reflect upon their behaviors of consumption and production of textile goods. UNESCO’s educational development goals (2017) encouraged the policymakers, consumers, educators, and producers to identify, suggest, implement, and analyze the processes that affect the sustainable goal.

Hence, Wood et al. (2022) defined the modes of sustainability for the establishment and conceptualization of sustainable practices could be either through pragmatic change or radical change. An exemplary company to understand pragmatic change is Patagonia (2014), involved in the use of established marketing and retail methods to carry forward the sustainable agenda. Since 1985, this clothing company has pledged 1% of its sales to the preservation and restoration of the natural environment. Contrary, the research of Mukendi et al. (2020) emphasizes taking action at the fundamental level while addressing the accepted sustainable practices of the industries.

A non-profit organization called “Council for Textile Recycling” (2023) located in the United States and United Kingdom takes prompt actions to reduce post-consumer textile waste and contributes towards textile recycling as the textile industries are the major contributors to landfills across the globe. Thus, the private sector is represented by academicians, brands, retailers, and consumers for recycling waste and creating more awareness.

On the other hand, a news published by Sattar and Akhtar (2023) at “All Pakistan Textile Mill Association” reported that Pakistan is a developing country and is one of the prime dump yards of European Union countries that discard unwanted clothing and post-consumer waste. In 2021, pre-owned branded clothes were approximately worth forty-six million USD imported to Pakistan for reselling; they ended up in dumping sites of the country. It was further discussed by Sattar and Akhtar (2023) the potential of Pakistan for recycling and redesigning imported secondhand clothing. It could be a successful business venture for the future market.

However, the producers and consumers must be aware and skilled to initiate the textile circulatory business.

Industrial sustainability: Insights from Western and Pakistani perspectives

To promote and practice circular economy of goods by the textile and fashion industries. Ellen MacArthur Foundation (2013) has extended the general methods for recycling, reusing, and reducing into extensive methods, including rethinking, preparation of reusing, material and chemical recovery, residual management, and unacceptable sources. Thus, such methods and processes are applied by multiple commercial industries to reduce the negative impact of manufacturing textile-based goods.

To bring social and economic change in design, a design should be given priority to being eco-friendly, human-centric, and restored or renewed as emphasized by UNESCO (2017). To reduce the harmful impact of textile pollution on the environment, collaborative research was conducted by Cao et al. (2013) from the United States and Reebok International Limited. They produced an innovative material called eco-leather, a substitute for original leather for the apparel and footwear industry. The prototypes were made from plant oils, natural fiber cloth, and chicken feather fibers. The testing for the acceptance of the prototypes was conducted on female college students to evaluate the proposed products' practicality, materiality, and versatility.

To motivate the textile industry a study conducted by Plieth et al. (2012) to commit to sustainable-oriented innovation, which is rare in the textile and apparel industries. An extensive case study was conducted on the German-based sustainable company Manomama. It was to address the economic success and technological innovation of the company that produced organic clothing for women, men, and children in southern Germany. In addition, strategic planning implemented by Patagonia (2014) and Fowler and Hope (2006) is another approach to protect the environment from hazardous pollution caused by the textile manufacturing industry. The research by Fowler and Hope (2006) primarily examined Hart's plans and execution for sustainable development, product stewardship, and pollution control. Patagonia demonstrated that advancement in a particular discipline does not have to depend on that in another by making notable strides in each. The study

tends to be in favor of resource accumulation for sustainable development strategies in combination.

An article on the adverse effects of fast fashion on the ecosystem was released in April 2019 by Profit Pakistan Today's e-magazine. The discussion continued with Mr. Mian Shahid, Chairman of United International Group, about the increasing pollution in Pakistan caused by the textile industry. The textile sector generates about 25 million metric tons of trash annually. Textile mills waste fifteen percent of the fiber used in textile production; in Pakistan alone, this amounts to a staggering sixty million kilograms. He reported that not sufficient has been done to improve the textile industry of Pakistan or recycle textile waste, making it the second-biggest polluter after the oil sector. He further elaborated that the clothing and upholstery industry is now estimated to be worth three thousand billion dollars, or about 2% of the world's gross domestic product. Seventy-five percent of the 100 billion clothes manufactured by the industry each year are exported to developed countries.

Comparatively, Sattar and Akhtar (2023) discussed the production of entirely novel clothing, the recycling and repurposing of recycled clothing in Pakistan contributes to lower greenhouse gas (GHG) emissions and water pollution. However, there has been increasing environmental concern and difficulty in promoting textile circularity in Pakistan due to the influx of ungoverned textile waste streams, fake labels applied to used apparel, and the unmonitored elimination of textile waste. Pakistan has a lot of potential for recycling and redesigning worn textiles, but there hasn't been sufficient progress in this area, and the majority of these garments end up in landfills and resale shops.

Moreover, an appropriate substitute that the industry could employ to promote business through recycled fashion is Recycled Polyester Staple Fiber (rPSF). Since rPSF is the most requested recycled substance, installing recycling plants for its production could accelerate and potentially impact the industry's commercial development. Because of its increased strength, reduced moisture absorption, great flexibility, and ease of manufacture, rPSF presents a significant revenue opportunity for textile industries. Pakistan's textile industry, which is transitioning from producing new textiles without a strategy to establishing circular enterprise models concentrating on eco-designed textile products and the recycling of used textiles, is paying particular attention to textile circularity. To meet UNESCO's (2017) and Sattar and Akhtar (2023) zero waste goals, textile industries are actively

implementing the policies and initiatives of the European Union. Nonetheless, industry-wide advancement must be boosted by cooperation, appropriate financial distribution, and training.

A news released by Hussain (2020) on Heim Textils 2020 which was held in Frankfurt, Germany, where Pakistan's textile industry received international recognition for its efforts to preserve the environment, especially in the production of denim. Lucie Brigham of the UN Office for Cooperation commended Pakistan's textile industry for introducing more ecologically friendly procedures, emphasizing that this represents a critical step toward accomplishing the Sustainable Development Goals established by UNESCO (2017). She was pleased with the fact that Pakistan's industry is rapidly embracing environmentally friendly methods. Moreover, Vice President Olaf Schmidt of Messe Frankfurt Textiles and Textile Technologies stressed the significance of the textile industry adhering to environmental protection regulations. Pakistani export enterprises emphasized that favorable prices were making it less complicated for businesses making environmentally friendly goods to compete on the international market. Major international textile chains are exclusively buying goods from manufacturers that possess a "Made in Green" license, indicating the fast-growing market for "Made in Green" products. Chairman of Al-Karam Towel Industries, Mehtabuddin Chawla, highlighted that Pakistan's textile industry cannot succeed in the international market without eco-friendly production methods and goods. A national pavilion with 56 small and medium-sized enterprises has been established by the Trade Development Authority of Pakistan. In the 50-year history of the competition, three young Pakistani designers debuted their eco-friendly textiles and designs. The names of the designers and organizations linked to them are still unidentified.

Besides exporting eco-friendly goods to the international market, the worldwide recognized retail brand Khaadi (2021) was launched in 1998 by Shamoos Sultan, who concurrently founded the Kreate Your Mark platform. By providing free access to Experience Hubs and Centers in Karachi and Lahore, as well as 100% sales participation, he supports women entrepreneurs in Pakistan. After a successful debut, Kreateurs—enthusiastic business owners who produce goods created in Pakistan—hope to grow their company and join Khaadi's supply chain, which will allow them to develop their operations. Similarly, another Pakistani retail apparel enterprise, Sapphire Textiles Limited (n.d.), was established in 1979. The company has a strong commitment to sustainability and waste reduction through reuse and

recycling. Given that recycling has a substantial environmental impact, the organization has launched “Restore” to encourage recycling in the textile industry. 32% of buyers go for “recycled” apparel, demonstrating the natural capacity to value the things that are significant to humans. Moreover, biodegradable polyester, created by Sapphire Textiles, enables synthetic fibers derived from plastic to behave more like natural fibers. Their eco-friendly bedsheets, duvets, comforters, pillows, and filler materials all employ this creative method, which guarantees lifespan and durability. The company intends to make the world a better and more precious environment for future generations by repurchasing and advocating “Restore”.

However, a study by Mahmood (2022) examines the challenges encountered by Pakistan's textile industries while implementing sustainable practices and additionally addresses the standards, aims, and certification criteria related to sustainability. The implementation of sustainability in the textile sector, which is the eighth largest exporter of textile goods across Asia, continues to struggle with multiple challenges regarding product design, production, post-processing, and recycling. Sixty percent of Pakistan's total exports originate from the textile sector, which employs over ten million farmers. Aspects of sustainability that are highlighted in the study include social responsibility, chemical usage, health concerns, the welfare of animals, waste consequences, availability of sustainable raw resources, and difficulties with manufacturing. The sector has a major influence on the economy of Pakistan.

Overview of proposed methodological approaches: An educational pedagogy

This section discusses recommendations on the following suggested approaches that educators could implement to educate the designers and educators. To teach individuals to consider how they consume textile products, to think about what they are contributing to, and to take deliberate action to provide research-based sustainable solutions. Considering the audience and ultimate goal, methodological approaches could be tailored while fulfilling the UNESCO Sustainable Agenda 2030. In addition to the researcher's experience and observations, the methodologies are influenced both directly and indirectly by the literature reviewed in this article. These approaches, however, might not be implemented exactly as suggested; instead, strategies could be altered or modified according to the circumstances of the educator's experience and the resources at their disposal. Being adaptable is

essential since it enables modifications that better reflect the unique circumstances and abilities of the organization or individuals.

Interactive hands-on workshops and seminars

A workshop could be designed by inviting industrial experts to provide training and share insights about current challenges, trends, technologies, materials, and processes to achieve sustainable innovative materials and practices. Furthermore, to make it research-based workshops along with providing hands-on experience to the undergraduate design students, a renowned sustainable textile designer or researcher could be summoned. Prior to organizing a respective interactive workshop, a research methodological seminar or webinar could be arranged. In which the most particular research tools and methods that are essential for textile design sustainability could be taught for more beneficial outcomes of sustainable practices. For instance, the origin and nature of material science, sustainable assessment, user-centered design solutions, and effective processes for manufacturing materials. To have maximum knowledge on the subject, international experts from the field could honor the webinar who applied innovative sustainable solutions in textile design.

Industrial collaboration with design institutions

To provide real-life experience, institutions could partner with textile companies where students and faculty can develop viable sustainable design solutions to real-world problems. Both faculty and design students could collaboratively apply research skills and contribute either to new projects or ongoing sustainable projects. This could benefit all faculty, students, and industry as a whole. An industry may possibly encourage internships that require students to undertake research-based sustainable projects. The study and analysis of the successful research-based industrial projects may later be incorporated into the curriculum of the design institutes. This might shift the interest of the students and faculty to produce sustainable solutions for real-world challenges. Additionally, frequent visits could be organized to industrial labs, studios, and manufacturing units where sustainable strategies are applied. The faculty and students could observe, study, and reflect on cutting-edge research and its implications in the textile industries of Pakistan. Similarly, Pakistan being the highest producer of agriculture, students could acquire knowledge concerning environmentally friendly materials by undertaking field trips

to locations where natural raw materials for textiles are produced. Students might additionally discover unexpected materials that Pakistan's textile industry has not yet explored.

Design competitions and collaborative research projects

To challenge and enhance the research skills and boost innovative solutions. The institutions could prepare and host events like competitions or hackathons to find sustainable solutions. The events could be interdisciplinary or multidisciplinary where students from diverse disciplines, like textile or fashion designing, textile engineering, or environmental sciences, bring together in either form of groups or individuals. In order to take this opportunity to investigate the complexes of the textile design industrial challenges and develop solutions specific to research themes such as sustainability, materiality, functionality, or any other aesthetic innovation that contributes to the green future of nature. Likewise, a research mentorship program from a longer period of time could also be arranged where industrial mentors could guide them in the process of developing research-based sustainable projects. In both practices, the students and faculty could focus on rapid improvement of research skills, prototyping, and testing of the proposed solutions. Digital platforms like Figma, Adobe XD or open-source design communities could be utilized to contribute to and learn from global projects, expend the socio-cultural influence, and work together on projects in real time regardless of locations and lack of physical resources.

Conferences and exhibitions

To encourage and improve the quality of research-based sustainable solutions. The institutions or industries create opportunities like conferences or thematic symposiums on emerging ideas of sustainability for faculty and students. In the presence of scholarly experts, industrialists, collaborators, and sponsors, to present their existing or new research investigations to the community for exchange of research-driven ideas. Moreover, to motivate, cater to the broader audience, and receive constructive feedback or suggestions to optimize the whole process of learning. Digital portfolios, traditional or virtual exhibitions, could reach out to the audience across the nation and international researchers or peers. This practical experience may possibly bring confidence, urge, and enthusiasm to both faculty and students to critically and creatively analyze the real problems.

Incorporation of artificial intelligence (AI)

Technologies have a crucial function in today's life of human beings. It revolutionized the way we live, perform, and communicate. Every sector of life benefit from technological advancements either in education, business, entertainment, or healthcare. In addition, a responsible utilization may avoid issues like overdependency and being influenced by misinformation provided by them. However, by embracing the power and potential of artificial intelligence, we may reduce the weaknesses and transform them into strengths. In particular, having substandard research skills and the incapacity of research assistants. The AI-driven platforms could effectively assist faculty and students to comprehend secondary data, broadening the interpretations by enhancing the research capabilities. This adaptive learning system may increase efficiency, quality, vocabulary, and grammar of the written research proposals. Moreover, to attract the current generation, digital applications and tools like augmented reality and virtual reality can create immersive virtual environments where they can explore the potential of the tools by exploring and experimenting with material properties, textures, patterns, and historical context in interactive simulated spaces. Through these mediums, awareness and collaborative research projects could be generated to fulfill the complexity of problems through digital tools.

Interactive storytelling

To engage and integrate the diversity of the students and faculty interests. Storytelling could be employed where the biography, achievements, and legacy of the industries, brands, and sustainable-oriented designers could be shared with the audience. These immersive and interactive narrative constructs engaging and contextually rich learning. This powerful tool incorporated with textile design could inspire the students and faculty from cultural narratives, personal experiences, and imagined scenarios. Integration of digital tools like Twine, Adobe Spark, and Canva where text, image, audio, and video could engage peer learning and active participation. Cross-cultural narratives and ethical storytelling can foster a deeper appreciation of diversity and inclusivity. These may provide experience beyond the surface-level of innovation, connection, and reflections required for sustainable solutions.

Conclusion

❖ Roadmap for future implementation

This pedagogical framework article provides insights into deciphering the industrial and educational contexts in which sustainable textile design is essential. To raise awareness, provide guidance, and instruct educators and designers pursuing fashion or textile design in Pakistan's higher education institutions. To fulfill UNESCO's sustainable development goal by 2030, the research seeks to transform the way that educators, designers, and policymakers conceive about the approach of adaptations and implementations of sustainable textiles. Nevertheless, the suggested approaches extend beyond the scope of this article. The article identifies the weaknesses in Pakistani higher education's research capabilities and provides recommendations for improving research quality that might benefit the industry and education sector. Moreover, the sustainable practices by national and international industries and educators to succeed in accomplishing the goal 2030. It could assist the educators to develop sustainable-oriented designers who could work for the "Green" environment either in collaboration with the industries or as entrepreneurs. The researcher has a deep commitment to developing effective pedagogical strategies to refine the transformative learning and teaching of both educators and students.

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Correspondence:

Sania Mubarak

sania.mubarak@iac.edu.pk
